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19. Data Report: High-Resolution Benthic Foraminiferal Stable Isotope Stratigraphy across the Oligocene/Miocene Boundary at Site 1218[1]

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ABSTRACT

The transition from the late Oligocene warm period into the early Miocene was marked by a series of rapid and brief episodes of cryospheric expansion and global cooling. We analyzed benthic foraminifers from nannofossil oozes recovered at Ocean Drilling Program Site 1218 to construct a stable isotope stratigraphy for the deep Pacific.

INTRODUCTION

Published benthic stable isotope data indicate long-term latest Oligocene warming and/or deglaciation was followed by a series of rapid and brief episodes of cryospheric expansion and/or global cooling during the earliest Miocene (Paul et al., 2000). Astronomically tuned high-resolution paired benthic and planktonic stable isotope records from the equatorial Atlantic (Ocean Drilling Program [ODP] Leg 154, Ceara Rise) have been used to suggest that the Mi-1 event represents a glaciation triggered by changes in orbital insolation. The lower Miocene through upper Oligocene sedimentary sequence from ODP Site 1218 presents a remarkable opportunity to study the evolution of deepwater hydrography in the equatorial Pacific Ocean. Very few data exist for the Pacific Ocean, a large region that plays a crucial role in controlling glo-

[1]Tripati, A., Elderfield, H., Booth, L., Zachos, J., and Ferretti, P., 2006. Data report: High-resolution benthic foraminiferal stable isotope stratigraphy across the Oligocene/Miocene boundary at Site 1218. *In* Wilson, P.A., Lyle, M., and Firth, J.V. (Eds.), *Proc. ODP, Sci. Results,* 199, 1–13 [Online]. Available from World Wide Web: <http://www-odp.tamu.edu/publications/199_SR/VOLUME/CHAPTERS/221.PDF>. [Cited YYYY-MM-DD]
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bal climate. The construction of a high-resolution stable isotope stratigraphy for the Pacific Ocean and comparison with results for Ceara Rise (Paul et al., 2000) and the Southern Ocean (Billups et al., 2002) will allow us to clearly distinguish basinal climate variability over suborbital timescales across the Oligocene/Miocene transition.

Site 1218 is located in the central equatorial Pacific (8°53.378′N; 135°22.00′W), just north of the Clipperton Fracture Zone. This site was drilled on 42-Ma crust at a water depth of 4826.3 m. Three holes were drilled, and a continuous sediment section to 42 Ma was recovered. The 273-m-thick sequence is dominated by Pleistocene–middle Miocene clay and radiolarian clay, Miocene–Oligocene nannofossil ooze and chalk, and Eocene radiolarian ooze, radiolarite, and chalk. The lower Miocene through upper Oligocene composite section from Site 1218 was well-recovered during advanced piston coring (APC). Sediments retain a high-quality paleomagnetic reversal stratigraphy. Average sedimentation rates across the Oligocene/Miocene transition are 1–2 cm/k.y., relatively high for a deep Pacific setting. Lithologic and physical property data exhibit a distinct cyclicity on the centimeter to decimeter scale. An orbitally tuned age model has been developed that integrates biostratigraphic and magnetic polarity datums (**Pälike et al.,** this volume).

Here we report the results of stable isotope analyses of benthic foraminifers from the lower Miocene through upper Oligocene sequence at Site 1218. Cores were sampled at 5-cm resolution. Benthic foraminifers range from rare to abundant throughout the interval of interest at Site 1218, and preservation of tests is very good to excellent. Benthic assemblages indicate lowermost bathyal and upper abyssal paleodepths.

METHODS

All sediment samples were freeze-dried, disaggregated in a buffered Calgon (sodium hexametaphosphate) solution, shaken for 2 hr in deionized water, and washed through a 63-µm sieve. Between 1 and 15 benthic foraminiferal specimens were picked from the >150-µm fraction of each sample. We selected *Nuttalides umbonifera* and species of *Cibicidoides* for measurement. Stable isotope ratios were measured at the University of Cambridge on a Micromass Multicarb sample preparation system attached to a PRISM mass spectrometer and are reported relative to the Vienna Peedee belemnite standard. Analytical precision was better than 0.08‰.

RESULTS

The $\delta^{18}O$ and $\delta^{13}C$ data for Holes 1218A and 1218B are listed in Table **T1.** A total of 556 samples were measured. Future comparison of the completed high-resolution record to the published Leg 154 stable isotope data will allow us to assess the phasing of glacial expansion relative to deep-sea circulation changes on orbital timescales.

T1. Stable isotope data, p. 5.

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Table T1. Benthic foraminiferal stable isotope data. (**See table note.** Continued on next eight pages.)

Core, section, interval (cm)	Depth (rmcd)	Age (Ma)	$\delta^{13}C$ (‰ VPDB)	$\delta^{18}O$ (‰ VPDB)	Taxon
199-1218B-					
9H-3, 0–2	81.740	21.554	1.02	0.62	*Cibicidoides* sp.
9H-3, 5–7	81.790	21.558	1.45	0.65	*Cibicidoides* sp.
9H-3, 10–12	81.840	21.563	1.17	0.66	*Cibicidoides* sp.
9H-3, 15–17	81.890	21.567	1.36	0.36	*Cibicidoides* sp.
9H-3, 20–22	81.940	21.571	1.72	0.76	*Cibicidoides* sp.
9H-3, 25–27	81.990	21.576	1.26	1.03	*Cibicidoides* sp.
9H-3, 30–32	82.040	21.58	1.25	0.50	*Cibicidoides* sp.
9H-3, 35–37	82.090	21.585	1.29	0.65	*Cibicidoides* sp.
9H-3, 40–42	82.140	21.589	0.83	0.29	*Cibicidoides* sp.
9H-3, 45–47	82.190	21.594	1.48	0.93	*Cibicidoides* sp.
9H-3, 50–52	82.240	21.598	1.26	0.77	*Cibicidoides* sp.
9H-3, 55–57	82.290	21.602	1.25	0.83	*Cibicidoides* sp.
9H-3, 60–62	82.340	21.607	1.92	0.21	*Cibicidoides* sp.
9H-3, 65–67	82.390	21.611	0.76	0.34	*Cibicidoides* sp.
9H-3, 70–72	82.440	21.616	1.17	0.48	*Cibicidoides* sp.
9H-3, 75–77	82.490	21.620	1.70	0.78	*Cibicidoides* sp.
9H-3, 85–87	82.590	21.629	0.66	0.36	*Cibicidoides* sp.
9H-3, 90–92	82.640	21.633	2.24	0.66	*Cibicidoides* sp.
9H-3, 95–97	82.690	21.638	1.84	1.30	*Cibicidoides* sp.
9H-3, 100–102	82.740	21.642	1.71	0.83	*Cibicidoides* sp.
9H-3, 105–107	82.790	21.646	1.20	0.81	*Cibicidoides* sp.
9H-3, 110–112	82.840	21.651	1.32	0.64	*Cibicidoides* sp.
9H-3, 110–112	82.840	21.651	1.46	0.95	*Cibicidoides* sp.
9H-3, 115–120	82.890	21.656	1.43	1.02	*Cibicidoides* sp.
9H-3, 120–122	82.940	21.66	1.38	1.12	*Cibicidoides* sp.
9H-3, 125–127	82.990	21.664	1.30	1.00	*Cibicidoides* sp.
9H-3, 130–132	83.040	21.669	1.48	1.02	*Cibicidoides* sp.
9H-3, 135–137	83.090	21.673	1.47	1.11	*Cibicidoides* sp.
9H-3, 140–142	83.140	21.677	1.47	0.67	*Cibicidoides* sp.
9H-3, 145–147	83.190	21.682	1.47	0.49	*Cibicidoides* sp.
9H-4, 0–2	83.240	21.686	1.49	0.88	*Cibicidoides* sp.
9H-4, 5–7	83.290	21.691	1.11	0.71	*Cibicidoides* sp.
9H-4, 10–12	83.340	21.695	1.39	0.61	*Cibicidoides* sp.
9H-4, 15–17	83.390	21.699	1.47	0.90	*Cibicidoides* sp.
9H-4, 20–22	83.440	21.704	1.25	0.81	*Cibicidoides* sp.
9H-4, 25–27	83.490	21.708	1.60	1.00	*Cibicidoides* sp.
9H-4, 30–32	83.540	21.713	1.67	0.99	*Cibicidoides* sp.
9H-4, 34–36	83.580	21.716	1.64	1.03	*Cibicidoides* sp.
9H-4, 40–42	83.640	21.721	1.42	0.81	*Cibicidoides* sp.
9H-4, 45–47	83.690	21.726	1.24	0.85	*Cibicidoides* sp.
9H-4, 50–52	83.740	21.73	0.97	0.65	*Cibicidoides* sp.
9H-4, 55–57	83.790	21.735	2.03	1.56	*Cibicidoides* sp.
9H-4, 60–62	83.840	21.739	1.15	1.04	*Cibicidoides* sp.
9H-4, 65–67	83.890	21.744	1.41	0.88	*Cibicidoides* sp.
9H-4, 70–72	83.940	21.748	1.48	0.69	*Cibicidoides* sp.
9H-4, 75–77	83.990	21.753	1.39	0.69	*Cibicidoides* sp.
9H-4, 80–82	84.040	21.758	1.64	0.36	*Cibicidoides* sp.
9H-4, 85–87	84.090	21.762	1.45	1.12	*Cibicidoides* sp.
9H-4, 90–92	84.140	21.767	1.65	1.12	*Cibicidoides* sp.
9H-4, 95–97	84.190	21.772	1.66	1.22	*Cibicidoides* sp.
9H-4, 100–102	84.240	21.776	1.13	0.93	*Cibicidoides* sp.
9H-4, 105–107	84.290	21.781	1.36	1.28	*Cibicidoides* sp.
9H-4, 110–112	84.340	21.786	1.58	1.22	*Cibicidoides* sp.
9H-4, 115–117	84.390	21.791	1.29	1.19	*Cibicidoides* sp.
9H-4, 120–122	84.440	21.797	1.44	1.14	*Cibicidoides* sp.
9H-4, 125–127	84.490	21.802	1.45	1.50	*Cibicidoides* sp.
9H-4, 130–132	84.540	21.807	1.24	1.23	*Cibicidoides* sp.
9H-4, 135–137	84.590	21.812	1.66	1.38	*Cibicidoides* sp.
9H-4, 140–142	84.640	21.818	1.34	1.34	*Cibicidoides* sp.
9H-4, 145–147	84.690	21.823	1.52	1.13	*Cibicidoides* sp.
9H-5, 0–2	84.740	21.828	1.39	1.36	*Cibicidoides* sp.
9H-5, 5–7	84.790	21.834	1.42	1.21	*Cibicidoides* sp.
9H-5, 10–12	84.840	21.839	1.57	1.23	*Cibicidoides* sp.
9H-5, 10–12	84.840	21.839	1.66	1.25	*Cibicidoides* sp.
9H-5, 15–17	84.890	21.844	1.65	1.21	*Cibicidoides* sp.
9H-5, 20–22	84.940	21.85	1.28	0.94	*Cibicidoides* sp.
9H-5, 25–27	84.990	21.855	1.40	1.20	*Cibicidoides* sp.

Table T1 (continued).

Core, section, interval (cm)	Depth (rmcd)	Age (Ma)	$\delta^{13}C$ (‰ VPDB)	$\delta^{18}O$ (‰ VPDB)	Taxon
9H-5, 30–32	85.040	21.86	1.60	0.82	*Cibicidoides* sp.
9H-5, 40–42	85.140	21.871	1.56	1.17	*Cibicidoides* sp.
9H-5, 50–52	85.240	21.882	1.35	1.10	*Cibicidoides* sp.
9H-5, 55–57	85.290	21.887	1.30	1.19	*Cibicidoides* sp.
9H-5, 60–62	85.340	21.892	1.76	1.39	*Cibicidoides* sp.
9H-5, 70–72	85.440	21.903	2.02	1.43	*Cibicidoides* sp.
9H-5, 80–82	85.540	21.913	1.87	1.41	*Cibicidoides* sp.
9H-5, 90–92	85.640	21.924	1.71	1.33	*Cibicidoides* sp.
9H-5, 95–97	85.690	21.929	1.64	1.36	*Cibicidoides* sp.
9H-5, 100–102	85.740	21.935	1.64	1.37	*Cibicidoides* sp.
9H-5, 110–112	85.840	21.945	1.81	1.25	*Cibicidoides* sp.
9H-5, 115–117	85.890	21.951	1.89	1.44	*Cibicidoides* sp.
9H-5, 120–122	85.940	21.956	1.84	1.48	*Cibicidoides* sp.
9H-5, 125–127	85.990	21.961	1.63	1.34	*Cibicidoides* sp.
9H-5, 130–132	86.040	21.967	1.56	1.44	*Cibicidoides* sp.
9H-5, 135–137	86.090	21.972	1.91	1.35	*Cibicidoides* sp.
9H-5, 140–142	86.140	21.977	1.92	1.17	*Cibicidoides* sp.
9H-6, 20–22	86.440	22.011	1.55	1.24	*Cibicidoides* sp.
9H-6, 30–32	86.540	22.025	1.65	1.20	*Cibicidoides* sp.
9H-6, 40–42	86.640	22.039	1.36	1.23	*Cibicidoides* sp.
9H-6, 50–52	86.740	22.053	1.66	1.16	*Cibicidoides* sp.
9H-6, 60–62	86.840	22.064	1.58	1.41	*Cibicidoides* sp.
9H-6, 70–72	86.940	22.074	1.61	0.86	*Cibicidoides* sp.
9H-6, 80–82	87.040	22.083	1.28	1.20	*Cibicidoides* sp.
9H-6, 95–97	87.190	22.098	1.42	1.27	*Cibicidoides* sp.
9H-6, 100–102	87.240	22.103	2.04	1.41	*Cibicidoides* sp.
199-1218A-					
9H-2, 85–86.5	87.310	22.109	1.25	1.48	*Cibicidoides* sp.
199-1218B-					
9H-6, 110–112	87.340	22.112	1.93	1.59	*Cibicidoides* sp.
199-1218A-					
9H-2, 90–91.5	87.360	22.114	1.87	1.40	*Cibicidoides* sp.
9H-2, 95–96.5	87.410	22.119	1.35	0.94	*Cibicidoides* sp.
199-1218B-					
9H-6, 120–122	87.433	22.121	1.77	1.30	*Cibicidoides* sp.
199-1218A-					
9H-2, 100–101.5	87.460	22.124	1.88	1.65	*Cibicidoides* sp.
199-1218B-					
9H-6, 130–132	87.499	22.127	2.08	1.51	*Cibicidoides* sp.
199-1218A-					
9H-2, 105–106.5	87.510	22.128	1.86	1.57	*Cibicidoides* sp.
9H-2, 110–111.5	87.560	22.133	1.96	1.52	*Cibicidoides* sp.
9H-2, 115–116.5	87.610	22.138	1.85	1.33	*Cibicidoides* sp.
9H-2, 120–121.5	87.660	22.143	1.96	1.50	*Cibicidoides* sp.
9H-2, 125–126.5	87.710	22.148	2.00	1.28	*Cibicidoides* sp.
9H-2, 130–131.5	87.760	22.152	1.70	1.39	*Cibicidoides* sp.
9H-2, 135–136.5	87.810	22.157	2.16	0.75	*Cibicidoides* sp.
9H-2, 140–141.5	87.860	22.162	1.95	1.37	*Cibicidoides* sp.
9H-2, 145–146.5	87.910	22.167	1.90	1.44	*Cibicidoides* sp.
9H-3, 0–1.5	87.960	22.172	1.68	1.32	*Cibicidoides* sp.
9H-3, 5–6.5	88.010	22.176	1.98	1.31	*Cibicidoides* sp.
9H-3, 5–6.5	88.010	22.176	1.82	1.22	*Nuttalides umbonifera*
9H-3, 10–11.5	88.060	22.181	1.85	1.38	*Cibicidoides* sp.
9H-3, 15–16.5	88.110	22.186	1.82	1.51	*Cibicidoides* sp.
9H-3, 15–16.5	88.110	22.186	1.68	1.13	*Nuttalides umbonifera*
9H-3, 20–21.5	88.160	22.191	1.71	1.30	*Cibicidoides* sp.
9H-3, 25–26.5	88.210	22.196	1.81	1.35	*Cibicidoides* sp.
9H-3, 25–26.5	88.210	22.196	1.62	1.07	*Nuttalides umbonifera*
9H-3, 30–31.5	88.260	22.2	1.87	1.56	*Cibicidoides* sp.
9H-3, 35–36.5	88.310	22.205	1.86	1.17	*Nuttalides umbonifera*
9H-3, 35–36.5	88.310	22.205	2.08	1.26	*Cibicidoides* sp.
9H-3, 40–41.5	88.360	22.21	2.27	0.40	*Cibicidoides* sp.
9H-3, 45–46.5	88.410	22.215	1.91	1.14	*Nuttalides umbonifera*
9H-3, 45–46.5	88.410	22.215	2.01	1.48	*Cibicidoides* sp.
9H-3, 50–51.5	88.460	22.22	1.88	1.17	*Cibicidoides* sp.
9H-3, 55–56.5	88.510	22.224	2.02	1.15	*Nuttalides umbonifera*

Table T1 (continued).

Core, section, interval (cm)	Depth (rmcd)	Age (Ma)	$\delta^{13}C$ (‰ VPDB)	$\delta^{18}O$ (‰ VPDB)	Taxon
9H-3, 55–56.5	88.510	22.224	2.09	1.31	*Cibicidoides* sp.
9H-3, 60–61.5	88.560	22.229	1.89	1.28	*Cibicidoides* sp.
9H-3, 65–66.5	88.610	22.234	2.02	1.21	*Nuttalides umbonifera*
9H-3, 65–66.5	88.610	22.234	2.02	1.46	*Cibicidoides* sp.
9H-3, 70–71.5	88.660	22.239	0.81	1.12	*Cibicidoides* sp.
9H-3, 75–76.5	88.710	22.244	1.90	1.45	*Cibicidoides* sp.
9H-3, 75–76.5	88.710	22.244	1.80	1.21	*Nuttalides umbonifera*
9H-3, 80–81.5	88.760	22.248	2.04	0.32	*Cibicidoides* sp.
9H-3, 85–86.5	88.810	22.253	1.97	1.23	*Nuttalides umbonifera*
9H-3, 85–86.5	88.810	22.253	1.72	1.45	*Cibicidoides* sp.
9H-3, 90–91.5	88.860	22.258	1.80	1.19	*Cibicidoides* sp.
9H-3, 95–96.5	88.910	22.263	2.09	1.16	*Nuttalides umbonifera*
9H-3, 95–96.5	88.910	22.263	1.77	1.32	*Cibicidoides* sp.
9H-3, 100–101.5	88.960	22.268	1.87	1.48	*Cibicidoides* sp.
9H-3, 105–106.5	89.010	22.272	1.79	1.37	*Cibicidoides* sp.
9H-3, 110–111.5	89.060	22.277	1.60	1.34	*Cibicidoides* sp.
9H-3, 115–116.5	89.110	22.282	1.81	1.24	*Cibicidoides* sp.
9H-3, 120–121.5	89.160	22.287	1.74	1.45	*Cibicidoides* sp.
9H-3, 125–126.5	89.210	22.292	1.74	1.57	*Cibicidoides* sp.
9H-3, 130–131.5	89.260	22.296	1.63	1.43	*Cibicidoides* sp.
9H-3, 135–136.5	89.310	22.301	1.88	1.57	*Cibicidoides* sp.
9H-3, 140–141.5	89.360	22.306	1.48	1.41	*Cibicidoides* sp.
9H-3, 145–146.5	89.410	22.311	1.21	1.45	*Cibicidoides* sp.
9H-4, 0–1.5	89.460	22.316	1.82	1.49	*Cibicidoides* sp.
9H-4, 0–1.5	89.460	22.316	1.74	1.20	*Nuttalides umbonifera*
9H-4, 5–6.5	89.510	22.32	1.60	1.24	*Cibicidoides* sp.
9H-4, 10–11.5	89.560	22.325	1.91	0.99	*Nuttalides umbonifera*
9H-4, 10–11.5	89.560	22.325	1.92	1.50	*Cibicidoides* sp.
9H-4, 15–16.5	89.610	22.33	1.90	1.44	*Cibicidoides* sp.
9H-4, 20–21.5	89.660	22.335	1.81	1.00	*Nuttalides umbonifera*
9H-4, 25–26.5	89.710	22.339	1.79	1.35	*Cibicidoides* sp.
9H-4, 30–31.5	89.760	22.344	1.89	1.10	*Nuttalides umbonifera*
9H-4, 30–31.5	89.760	22.344	1.74	1.29	*Cibicidoides* sp.
9H-4, 35–36.5	89.810	22.348	1.85	1.39	*Cibicidoides* sp.
9H-4, 40–41.5	89.860	22.353	1.80	1.18	*Nuttalides umbonifera*
9H-4, 40–41.5	89.860	22.353	1.86	1.33	*Cibicidoides* sp.
9H-4, 45–46.5	89.910	22.358	1.73	1.60	*Cibicidoides* sp.
9H-4, 50–51.5	89.960	22.362	1.73	1.40	*Cibicidoides* sp.
9H-4, 50–51.5	89.960	22.362	1.70	1.16	*Nuttalides umbonifera*
9H-4, 55–56.5	90.010	22.367	1.83	1.47	*Cibicidoides* sp.
9H-4, 60–61.5	90.060	22.371	1.62	1.11	*Nuttalides umbonifera*
9H-4, 60–61.5	90.060	22.371	1.78	1.40	*Cibicidoides* sp.
9H-4, 65–66.5	90.110	22.376	1.45	1.66	*Cibicidoides* sp.
9H-4, 70–71.5	90.160	22.381	0.73	0.91	*Cibicidoides* sp.
9H-4, 75–76.5	90.210	22.385	1.73	1.39	*Cibicidoides* sp.
9H-4, 80–81.5	90.260	22.39	1.51	1.17	*Cibicidoides* sp.
9H-4, 85–86.5	90.310	22.394	1.79	1.31	*Cibicidoides* sp.
9H-4, 90–91.5	90.360	22.399	1.91	1.24	*Cibicidoides* sp.
9H-4, 95–96.5	90.410	22.403	1.80	1.55	*Cibicidoides* sp.
9H-4, 100–101.5	90.460	22.408	1.47	1.32	*Cibicidoides* sp.
9H-4, 105–106.5	90.510	22.413	1.39	1.41	*Cibicidoides* sp.
9H-4, 110–111.5	90.560	22.417	1.39	1.34	*Cibicidoides* sp.
9H-4, 115–116.5	90.610	22.422	1.68	1.01	*Cibicidoides* sp.
9H-4, 120–121.5	90.660	22.426	1.96	1.46	*Cibicidoides* sp.
9H-4, 125–126.5	90.710	22.431	1.40	1.31	*Cibicidoides* sp.
9H-4, 130–131.5	90.760	22.435	1.72	1.42	*Cibicidoides* sp.
9H-4, 135–136.5	90.810	22.44	2.00	1.81	*Cibicidoides* sp.
9H-4, 140–141.5	90.860	22.445	1.39	1.48	*Cibicidoides* sp.
9H-4, 145–146.5	90.910	22.449	2.16	0.41	*Cibicidoides* sp.
9H-5, 30–31.5	91.260	22.481	1.68	1.16	*Cibicidoides* sp.
9H-5, 40–41.5	91.360	22.49	1.44	1.12	*Cibicidoides* sp.
9H-6, 0–1.5	92.460	22.592	1.82	1.05	*Cibicidoides* sp.
9H-6, 10–11.5	92.560	22.602	1.79	1.21	*Cibicidoides* sp.
9H-6, 15–16.5	92.610	22.608	1.49	1.52	*Cibicidoides* sp.
9H-6, 30–31.5	92.760	22.624	1.52	1.18	*Cibicidoides* sp.
9H-6, 40–41.5	92.860	22.634	2.21	1.45	*Cibicidoides* sp.
9H-6, 45–46.5	92.910	22.639	1.57	1.03	*Cibicidoides* sp.
9H-6, 55–56.5	93.010	22.65	1.57	1.22	*Cibicidoides* sp.
9H-6, 60–61.5	93.060	22.655	1.82	1.05	*Cibicidoides* sp.

Table T1 (continued).

Core, section, interval (cm)	Depth (rmcd)	Age (Ma)	$\delta^{13}C$ (‰ VPDB)	$\delta^{18}O$ (‰ VPDB)	Taxon
9H-6, 70–71.5	93.160	22.666	1.60	1.55	*Cibicidoides* sp.
9H-6, 75–76.5	93.210	22.671	1.58	1.20	*Cibicidoides* sp.
9H-6, 80–81.5	93.260	22.677	1.82	1.06	*Cibicidoides* sp.
9H-6, 85–86.5	93.310	22.682	1.76	1.31	*Cibicidoides* sp.
9H-6, 90–91.5	93.360	22.687	1.79	1.21	*Cibicidoides* sp.
9H-6, 95–96.5	93.410	22.693	1.49	1.52	*Cibicidoides* sp.
9H-6, 100–101.5	93.460	22.698	1.61	0.76	*Cibicidoides* sp.
9H-6, 100–101.5	93.460	22.698	1.79	1.18	*Cibicidoides* sp.
9H-6, 105–106.5	93.510	22.703	1.58	0.73	*Cibicidoides* sp.
199-1218B-					
10H-2, 130–132	93.508	22.703	1.33	0.98	*Cibicidoides* sp.
199-1218A-					
9H-6, 110–111.5	93.560	22.708	1.77	1.55	*Cibicidoides* sp.
9H-6, 110–111.5	93.560	22.708	1.18	0.47	*Cibicidoides* sp.
199-1218B-					
10H-2, 135–137	93.553	22.708	1.83	1.50	*Cibicidoides* sp.
10H-2, 140–142	93.600	22.713	1.87	1.34	*Cibicidoides* sp.
199-1218A-					
9H-6, 115–116.5	93.612	22.714	1.52	1.18	*Cibicidoides* sp.
199-1218B-					
10H-2, 145–147	93.650	22.718	2.01	1.49	*Cibicidoides* sp.
199-1218A-					
9H-6, 120–121.5	93.666	22.719	1.34	1.40	*Cibicidoides* sp.
199-1218B-					
10H-3, 0–2	93.700	22.723	1.88	1.40	*Cibicidoides* sp.
10H-3, 5–7	93.750	22.728	1.72	1.33	*Cibicidoides* sp.
10H-3, 10–12	93.800	22.734	2.15	1.18	*Cibicidoides* sp.
10H-3, 15–17	93.850	22.739	1.88	1.36	*Cibicidoides* sp.
10H-3, 20–22	93.900	22.744	1.52	1.12	*Cibicidoides* sp.
10H-3, 25–27	93.950	22.749	1.88	1.64	*Cibicidoides* sp.
10H-3, 30–32	94.000	22.755	1.77	1.41	*Cibicidoides* sp.
10H-3, 35–37	94.050	22.76	1.75	1.44	*Cibicidoides* sp.
10H-3, 40–42	94.100	22.765	1.87	1.53	*Cibicidoides* sp.
10H-3, 45–47	94.150	22.77	1.99	0.91	*Cibicidoides* sp.
10H-3, 50–52	94.200	22.775	1.37	1.01	*Cibicidoides* sp.
10H-3, 55–57	94.250	22.781	1.52	1.05	*Cibicidoides* sp.
10H-3, 60–62	94.300	22.786	1.47	0.94	*Cibicidoides* sp.
10H-3, 65–67	94.350	22.791	1.81	1.28	*Cibicidoides* sp.
10H-3, 70–72	94.400	22.796	1.42	1.34	*Cibicidoides* sp.
10H-3, 75–77	94.450	22.802	1.04	1.22	*Cibicidoides* sp.
10H-3, 80–82	94.500	22.807	1.56	1.27	*Cibicidoides* sp.
10H-3, 85–87	94.550	22.812	1.71	0.99	*Cibicidoides* sp.
10H-3, 90–92	94.600	22.817	1.31	1.38	*Cibicidoides* sp.
10H-3, 100–102	94.700	22.828	1.97	1.52	*Cibicidoides* sp.
10H-3, 105–107	94.750	22.833	1.78	1.63	*Cibicidoides* sp.
10H-3, 110–112	94.800	22.839	1.90	1.60	*Cibicidoides* sp.
10H-3, 115–117	94.850	22.845	1.97	1.19	*Cibicidoides* sp.
10H-3, 120–122	94.900	22.852	1.80	1.45	*Cibicidoides* sp.
10H-3, 125–127	94.950	22.859	1.67	1.59	*Cibicidoides* sp.
10H-3, 135–137	95.050	22.872	2.07	1.32	*Cibicidoides* sp.
10H-3, 140–142	95.100	22.878	1.96	1.76	*Cibicidoides* sp.
10H-3, 145–147	95.150	22.885	1.79	1.64	*Cibicidoides* sp.
10H-4, 0–2	95.200	22.892	1.48	1.55	*Cibicidoides* sp.
10H-4, 5–7	95.250	22.898	1.78	1.39	*Cibicidoides* sp.
10H-4, 10–12	95.300	22.905	1.72	1.39	*Cibicidoides* sp.
10H-4, 15–17	95.350	22.912	1.85	1.44	*Cibicidoides* sp.
10H-4, 20–22	95.400	22.918	1.65	1.35	*Cibicidoides* sp.
10H-4, 45–47	95.650	22.951	1.85	1.42	*Cibicidoides* sp.
10H-4, 50–52	95.700	22.958	1.92	1.59	*Cibicidoides* sp.
10H-4, 55–57	95.750	22.965	1.65	1.36	*Cibicidoides* sp.
10H-4, 55–57	95.750	22.965	1.81	1.47	*Cibicidoides* sp.
10H-4, 65–67	95.850	22.978	1.94	1.49	*Cibicidoides* sp.
10H-4, 70–72	95.900	22.984	1.86	1.70	*Cibicidoides* sp.
10H-4, 75–77	95.950	22.991	2.27	1.47	*Cibicidoides* sp.
10H-4, 80–82	96.000	22.998	2.15	1.47	*Cibicidoides* sp.
10H-4, 85–87	96.050	23.004	1.87	1.36	*Cibicidoides* sp.

Table T1 (continued).

Core, section, interval (cm)	Depth (rmcd)	Age (Ma)	$\delta^{13}C$ (‰ VPDB)	$\delta^{18}O$ (‰ VPDB)	Taxon
10H-4, 90–92	96.100	23.011	2.11	1.32	*Cibicidoides* sp.
10H-4, 100–102	96.200	23.024	2.13	1.38	*Cibicidoides* sp.
10H-4, 105–107	96.250	23.03	2.08	1.30	*Cibicidoides* sp.
10H-4, 115–117	96.350	23.038	2.05	1.53	*Cibicidoides* sp.
10H-4, 125–127	96.450	23.046	2.29	1.49	*Cibicidoides* sp.
10H-4, 140–142	96.600	23.058	1.99	1.49	*Cibicidoides* sp.
10H-4, 145–147	96.650	23.062	2.20	1.57	*Cibicidoides* sp.
10H-5, 0–2	96.700	23.066	1.86	1.41	*Cibicidoides* sp.
10H-5, 5–7	96.750	23.07	2.22	1.56	*Cibicidoides* sp.
10H-5, 10–12	96.800	23.074	2.04	1.08	*Cibicidoides* sp.
10H-5, 15–17	96.850	23.078	2.11	1.36	*Cibicidoides* sp.
10H-5, 20–22	96.900	23.082	2.24	1.11	*Nuttalides umbonifera*
10H-5, 20–22	96.900	23.082	2.12	1.34	*Cibicidoides* sp.
10H-5, 25–27	96.950	23.086	2.18	1.17	*Nuttalides umbonifera*
10H-5, 25–27	96.950	23.086	2.32	1.45	*Cibicidoides* sp.
10H-5, 25–27	96.950	23.086	2.22	1.55	*Cibicidoides* sp.
10H-5, 30–32	97.000	23.09	2.17	1.29	*Nuttalides umbonifera*
10H-5, 30–32	97.000	23.09	2.26	1.16	*Cibicidoides* sp.
10H-5, 30–32	97.000	23.09	2.15	1.31	*Cibicidoides* sp.
10H-5, 35–37	97.050	23.094	2.15	1.27	*Cibicidoides* sp.
10H-5, 35–37	97.050	23.094	1.97	1.31	*Cibicidoides* sp.
10H-5, 40–42	97.100	23.098	2.26	1.28	*Cibicidoides* sp.
10H-5, 40–42	97.100	23.098	2.05	1.27	*Nuttalides umbonifera*
10H-5, 40–42	97.100	23.098	2.11	1.53	*Cibicidoides* sp.
10H-5, 45–47	97.150	23.102	2.22	1.21	*Nuttalides umbonifera*
10H-5, 45–47	97.150	23.102	2.13	1.50	*Cibicidoides* sp.
10H-5, 50–52	97.200	23.106	2.17	1.19	*Nuttalides umbonifera*
10H-5, 50–52	97.200	23.106	2.14	1.42	*Cibicidoides* sp.
10H-5, 55–57	97.250	23.11	1.98	1.20	*Nuttalides umbonifera*
10H-5, 55–57	97.250	23.11	1.76	1.46	*Cibicidoides* sp.
10H-5, 60–62	97.300	23.114	1.95	1.15	*Nuttalides umbonifera*
10H-5, 60–62	97.300	23.114	1.71	1.50	*Cibicidoides* sp.
10H-5, 60–62	97.300	23.114	2.24	1.32	*Cibicidoides* sp.
10H-5, 65–67	97.350	23.118	2.04	1.08	*Nuttalides umbonifera*
10H-5, 65–67	97.350	23.118	1.87	1.40	*Cibicidoides* sp.
10H-5, 65–67	97.350	23.118	2.17	1.39	*Cibicidoides* sp.
10H-5, 70–72	97.400	23.122	2.19	1.28	*Cibicidoides* sp.
10H-5, 70–72	97.400	23.122	1.78	1.38	*Cibicidoides* sp.
10H-5, 75–77	97.450	23.126	2.04	1.02	*Nuttalides umbonifera*
10H-5, 75–77	97.450	23.126	2.12	1.58	*Cibicidoides* sp.
10H-5, 75–77	97.450	23.126	1.98	1.43	*Cibicidoides* sp.
10H-5, 80–82	97.500	23.129	2.01	1.41	*Cibicidoides* sp.
10H-5, 80–82	97.500	23.129	2.16	1.24	*Cibicidoides* sp.
10H-5, 85–87	97.550	23.133	1.96	1.04	*Nuttalides umbonifera*
10H-5, 85–87	97.550	23.133	2.26	1.29	*Cibicidoides* sp.
10H-5, 85–87	97.550	23.133	1.76	0.98	*Cibicidoides* sp.
10H-5, 90–92	97.600	23.137	2.01	1.04	*Nuttalides umbonifera*
10H-5, 90–92	97.600	23.137	2.18	1.40	*Cibicidoides* sp.
10H-5, 90–92	97.600	23.137	2.10	1.28	*Cibicidoides* sp.
10H-5, 95–97	97.650	23.141	1.94	1.03	*Nuttalides umbonifera*
10H-5, 95–97	97.650	23.141	2.18	1.47	*Cibicidoides* sp.
10H-5, 95–97	97.650	23.141	1.72	1.38	*Cibicidoides* sp.
10H-5, 100–102	97.700	23.145	1.94	0.96	*Nuttalides umbonifera*
10H-5, 100–102	97.700	23.145	1.49	0.44	*Cibicidoides* sp.
10H-5, 100–102	97.700	23.145	1.90	1.30	*Cibicidoides* sp.
10H-5, 105–107	97.750	23.149	1.85	1.03	*Nuttalides umbonifera*
10H-5, 105–107	97.750	23.149	1.85	1.18	*Cibicidoides* sp.
10H-5, 110–112	97.800	23.153	1.66	0.92	*Nuttalides umbonifera*
10H-5, 110–112	97.800	23.153	1.84	0.72	*Cibicidoides* sp.
10H-5, 115–117	97.850	23.157	1.77	0.92	*Cibicidoides* sp.
10H-5, 120–122	97.900	23.161	1.92	0.87	*Nuttalides umbonifera*
10H-5, 120–122	97.900	23.161	1.90	1.17	*Cibicidoides* sp.
10H-5, 120–122	97.900	23.161	1.51	1.09	*Cibicidoides* sp.
10H-5, 130–132	98.000	23.169	1.77	0.79	*Nuttalides umbonifera*
10H-5, 130–132	98.000	23.169	1.83	1.15	*Cibicidoides* sp.
10H-5, 130–132	98.000	23.169	1.81	1.22	*Cibicidoides* sp.
10H-5, 135–137	98.050	23.173	1.80	0.83	*Nuttalides umbonifera*
10H-5, 135–137	98.050	23.173	1.80	1.21	*Cibicidoides* sp.
10H-5, 135–137	98.050	23.173	1.58	1.08	*Cibicidoides* sp.

Table T1 (continued).

Core, section, interval (cm)	Depth (rmcd)	Age (Ma)	$\delta^{13}C$ (‰ VPDB)	$\delta^{18}O$ (‰ VPDB)	Taxon
10H-5, 145–147	98.150	23.181	1.65	0.93	*Cibicidoides* sp.
10H-5, 145–147	98.150	23.181	1.81	1.46	*Cibicidoides* sp.
10H-5, 145–147	98.150	23.181	1.65	1.33	*Cibicidoides* sp.
199-1218A-					
10H-4, 45–47	101.050	23.423	1.41	1.39	*Cibicidoides* sp.
10H-4, 80–82	101.400	23.458	1.75	1.15	*Cibicidoides* sp.
10H-4, 90–92	101.500	23.468	1.35	1.22	*Cibicidoides* sp.
10H-4, 95–97	101.550	23.473	1.37	1.23	*Cibicidoides* sp.
10H-4, 105–107	101.650	23.484	1.96	1.39	*Cibicidoides* sp.
10H-4, 125–127	101.850	23.504	1.80	1.25	*Cibicidoides* sp.
10H-4, 130–132	101.900	23.509	1.38	1.45	*Cibicidoides* sp.
10H-4, 140–142	102.000	23.519	1.55	0.95	*Cibicidoides* sp.
10H-5, 0–2	102.100	23.529	2.22	1.47	*Cibicidoides* sp.
10H-5, 0–2	102.100	23.529	1.67	1.22	*Cibicidoides* sp.
10H-5, 0–2	102.100	23.529	2.11	1.20	*Nuttalides umbonifera*
10H-5, 5–7	102.150	23.534	1.46	1.13	*Cibicidoides* sp.
10H-5, 5–7	102.150	23.534	2.11	1.17	*Nuttalides umbonifera*
10H-5, 10–12	102.200	23.539	2.05	1.16	*Nuttalides umbonifera*
10H-5, 10–12	102.200	23.539	2.28	1.39	*Cibicidoides* sp.
10H-5, 10–12	102.200	23.539	1.92	1.20	*Cibicidoides* sp.
10H-5, 15–17	102.250	23.544	2.20	1.14	*Nuttalides umbonifera*
10H-5, 15–17	102.250	23.544	2.24	1.48	*Cibicidoides* sp.
10H-5, 20–22	102.300	23.549	1.70	1.20	*Cibicidoides* sp.
10H-5, 25–27	102.350	23.554	1.56	1.35	*Cibicidoides* sp.
10H-5, 30–32	102.400	23.559	1.42	1.14	*Cibicidoides* sp.
10H-5, 35–37	102.450	23.564	1.67	1.49	*Cibicidoides* sp.
10H-5, 40–42	102.500	23.569	1.76	1.45	*Cibicidoides* sp.
10H-5, 45–47	102.550	23.574	1.57	1.15	*Cibicidoides* sp.
10H-5, 50–52	102.600	23.579	1.49	0.83	*Cibicidoides* sp.
10H-5, 55–57	102.650	23.584	1.22	1.10	*Cibicidoides* sp.
10H-5, 60–62	102.700	23.589	1.73	1.39	*Cibicidoides* sp.
10H-5, 65–67	102.750	23.594	1.58	1.17	*Cibicidoides* sp.
10H-5, 70–72	102.800	23.599	1.81	0.90	*Cibicidoides* sp.
10H-5, 75–77	102.850	23.604	1.90	1.20	*Cibicidoides* sp.
10H-5, 80–82	102.900	23.609	1.89	1.29	*Cibicidoides* sp.
10H-5, 85–87	102.950	23.614	1.47	0.92	*Cibicidoides* sp.
10H-5, 90–92	103.000	23.619	1.25	1.25	*Cibicidoides* sp.
10H-5, 95–97	103.050	23.625	1.70	1.38	*Cibicidoides* sp.
10H-5, 100–102	103.100	23.63	1.53	1.12	*Cibicidoides* sp.
10H-5, 105–107	103.150	23.635	1.70	1.19	*Cibicidoides* sp.
10H-5, 110–112	103.200	23.64	1.68	1.35	*Cibicidoides* sp.
10H-5, 115–117	103.250	23.645	1.85	1.17	*Cibicidoides* sp.
10H-5, 120–122	103.300	23.65	1.67	1.16	*Cibicidoides* sp.
10H-5, 120–122	103.300	23.65	1.83	1.25	*Cibicidoides* sp.
10H-5, 120–122	103.300	23.65	1.84	0.89	*Nuttalides umbonifera*
10H-5, 125–127	103.350	23.655	1.89	1.11	*Cibicidoides* sp.
10H-5, 130–132	103.400	23.66	2.14	0.94	*Cibicidoides* sp.
10H-5, 135–137	103.450	23.665	1.60	0.96	*Cibicidoides* sp.
10H-6, 0–2	103.600	23.68	1.95	1.04	*Cibicidoides* sp.
10H-6, 5–7	103.650	23.685	1.83	1.13	*Cibicidoides* sp.
10H-6, 10–12	103.700	23.69	1.69	0.89	*Cibicidoides* sp.
10H-6, 15–17	103.750	23.695	1.53	0.99	*Cibicidoides* sp.
10H-6, 25–27	103.850	23.705	1.54	0.78	*Cibicidoides* sp.
10H-6, 30–32	103.900	23.71	1.58	0.17	*Cibicidoides* sp.
10H-6, 35–37	103.950	23.715	1.73	1.24	*Cibicidoides* sp.
10H-6, 40–42	104.000	23.72	1.98	1.17	*Cibicidoides* sp.
10H-6, 45–47	104.050	23.725	1.21	0.99	*Cibicidoides* sp.
10H-6, 50–52	104.100	23.73	1.60	1.20	*Cibicidoides* sp.
10H-6, 55–57	104.150	23.735	1.15	0.57	*Cibicidoides* sp.
10H-6, 60–62	104.200	23.74	1.04	0.84	*Cibicidoides* sp.
10H-6, 65–67	104.250	23.745	1.38	0.83	*Cibicidoides* sp.
10H-6, 70–72	104.300	23.75	1.65	0.81	*Cibicidoides* sp.
11H-2, 5–7	104.319	23.752	1.93	0.87	*Cibicidoides* sp.
10H-6, 75–77	104.350	23.755	1.06	0.38	*Cibicidoides* sp.
10H-6, 75–77	104.350	23.755	1.16	0.72	*Cibicidoides* sp.
199-1218B-					
11H-2, 10–12	104.372	23.758	1.29	0.96	*Cibicidoides* sp.

Table T1 (continued).

Core, section, interval (cm)	Depth (rmcd)	Age (Ma)	$\delta^{13}C$ (‰ VPDB)	$\delta^{18}O$ (‰ VPDB)	Taxon
199-1218A-					
10H-6, 80–82	104.400	23.76	1.75	0.62	*Cibicidoides* sp.
199-1218B-					
11H-2, 15–17	104.425	23.763	1.19	0.62	*Cibicidoides* sp.
199-1218A-					
10H-6, 85–87	104.450	23.765	1.39	1.01	*Cibicidoides* sp.
199-1218B-					
11H-2, 20–22	104.478	23.768	1.12	0.49	*Cibicidoides* sp.
199-1218A-					
10H-6, 90–92	104.500	23.77	1.44	0.39	*Cibicidoides* sp.
199-1218B-					
11H-2, 25–27	104.530	23.774	1.72	0.45	*Cibicidoides* sp.
199-1218A-					
10H-6, 95–97	104.544	23.775	1.19	0.40	*Cibicidoides* sp.
10H-6, 95–97	104.544	23.775	1.17	0.53	*Cibicidoides* sp.
10H-6, 100–102	104.584	23.779	1.20	0.52	*Cibicidoides* sp.
10H-6, 105–107	104.625	23.783	1.18	0.77	*Cibicidoides* sp.
10H-6, 110–112	104.665	23.787	1.51	0.61	*Cibicidoides* sp.
199-1218B-					
11H-2, 40–42	104.680	23.789	1.15	0.69	*Cibicidoides* sp.
11H-2, 45–47	104.730	23.794	1.05	0.42	*Cibicidoides* sp.
11H-2, 50–52	104.780	23.799	1.63	0.57	*Cibicidoides* sp.
11H-2, 55–57	104.830	23.804	1.69	1.29	*Cibicidoides* sp.
11H-2, 60–62	104.880	23.809	1.10	0.55	*Cibicidoides* sp.
11H-2, 65–67	104.930	23.814	1.06	0.64	*Cibicidoides* sp.
11H-2, 70–72	104.980	23.819	1.38	0.48	*Cibicidoides* sp.
11H-2, 75–77	105.030	23.824	1.49	1.02	*Cibicidoides* sp.
11H-2, 80–82	105.080	23.829	1.30	0.66	*Cibicidoides* sp.
11H-2, 85–87	105.130	23.834	1.24	0.78	*Cibicidoides* sp.
11H-2, 90–92	105.180	23.839	1.44	1.11	*Cibicidoides* sp.
11H-2, 95–97	105.230	23.844	1.16	0.76	*Cibicidoides* sp.
11H-2, 100–102	105.280	23.849	1.03	0.61	*Cibicidoides* sp.
11H-2, 105–107	105.330	23.854	1.43	0.89	*Cibicidoides* sp.
11H-2, 110–112	105.380	23.859	1.53	0.91	*Cibicidoides* sp.
11H-2, 115–117	105.430	23.864	1.24	0.66	*Cibicidoides* sp.
11H-2, 120–122	105.480	23.869	1.31	0.51	*Cibicidoides* sp.
11H-2, 125–127	105.530	23.874	1.33	0.89	*Cibicidoides* sp.
11H-2, 130–132	105.580	23.879	1.44	0.88	*Cibicidoides* sp.
11H-2, 135–137	105.630	23.884	1.41	1.01	*Cibicidoides* sp.
11H-2, 140–142	105.680	23.889	1.65	1.14	*Cibicidoides* sp.
11H-2, 145–147	105.730	23.894	1.24	0.92	*Cibicidoides* sp.
11H-3, 0–2	105.780	23.899	1.91	1.03	*Cibicidoides* sp.
11H-3, 5–7	105.830	23.904	1.65	0.99	*Cibicidoides* sp.
11H-3, 10–12	105.880	23.909	1.53	0.71	*Cibicidoides* sp.
11H-3, 15–17	105.930	23.914	1.56	0.59	*Cibicidoides* sp.
11H-3, 20–22	105.980	23.919	1.42	0.92	*Cibicidoides* sp.
11H-3, 25–27	106.030	23.925	1.38	0.66	*Cibicidoides* sp.
11H-3, 30–32	106.080	23.93	1.35	0.75	*Cibicidoides* sp.
11H-3, 35–37	106.130	23.935	1.15	0.71	*Cibicidoides* sp.
11H-3, 40–42	106.180	23.94	1.64	0.90	*Cibicidoides* sp.
11H-3, 45–47	106.230	23.945	1.65	0.83	*Cibicidoides* sp.
11H-3, 50–52	106.280	23.95	1.59	0.94	*Cibicidoides* sp.
11H-3, 55–57	106.330	23.955	1.45	0.76	*Cibicidoides* sp.
11H-3, 60–62	106.380	23.96	1.52	0.85	*Cibicidoides* sp.
11H-3, 65–67	106.430	23.965	1.17	0.53	*Cibicidoides* sp.
11H-3, 70–72	106.480	23.97	1.33	0.91	*Cibicidoides* sp.
11H-3, 75–77	106.530	23.975	1.46	0.88	*Cibicidoides* sp.
11H-3, 80–82	106.580	23.98	1.40	0.52	*Cibicidoides* sp.
11H-3, 85–87	106.630	23.985	1.43	0.68	*Cibicidoides* sp.
11H-3, 90–92	106.680	23.99	1.39	0.53	*Cibicidoides* sp.
11H-3, 95–97	106.730	23.995	1.42	0.44	*Cibicidoides* sp.
11H-3, 100–102	106.780	24	1.36	0.93	*Cibicidoides* sp.
11H-3, 105–107	106.830	24.005	1.63	0.99	*Cibicidoides* sp.
11H-3, 110–112	106.880	24.01	1.29	0.41	*Cibicidoides* sp.
11H-3, 115–117	106.930	24.015	1.58	0.55	*Cibicidoides* sp.
11H-3, 120–122	106.980	24.02	1.57	0.47	*Cibicidoides* sp.

Table T1 (continued).

Core, section, interval (cm)	Depth (rmcd)	Age (Ma)	$\delta^{13}C$ (‰ VPDB)	$\delta^{18}O$ (‰ VPDB)	Taxon
11H-3, 125–127	107.030	24.025	1.53	0.87	*Cibicidoides* sp.
11H-3, 130–132	107.080	24.03	1.78	0.27	*Cibicidoides* sp.
11H-3, 135–137	107.130	24.035	1.45	0.52	*Cibicidoides* sp.
11H-3, 140–142	107.180	24.04	1.44	0.87	*Cibicidoides* sp.
11H-3, 145–147	107.230	24.045	0.96	0.69	*Cibicidoides* sp.
11H-4, 0–2	107.280	24.05	1.57	0.63	*Cibicidoides* sp.
11H-4, 5–7	107.330	24.055	1.39	0.73	*Cibicidoides* sp.
11H-4, 10–12	107.380	24.059	1.24	0.46	*Cibicidoides* sp.
11H-4, 15–17	107.430	24.064	1.41	0.50	*Cibicidoides* sp.
11H-4, 20–22	107.480	24.069	1.69	0.40	*Cibicidoides* sp.
11H-4, 25–27	107.530	24.074	1.63	0.96	*Cibicidoides* sp.
11H-4, 30–32	107.580	24.079	1.07	0.69	*Cibicidoides* sp.
11H-4, 35–37	107.630	24.083	1.42	0.44	*Cibicidoides* sp.
11H-4, 40–42	107.680	24.088	1.13	0.53	*Cibicidoides* sp.
11H-4, 45–47	107.730	24.093	1.26	0.32	*Cibicidoides* sp.
11H-4, 50–52	107.780	24.098	1.28	0.46	*Cibicidoides* sp.
11H-4, 55–57	107.830	24.103	1.24	0.54	*Cibicidoides* sp.
11H-4, 60–62	107.880	24.107	1.19	0.52	*Cibicidoides* sp.
11H-4, 65–67	107.930	24.112	1.22	0.30	*Cibicidoides* sp.
11H-4, 70–72	107.980	24.117	1.03	0.23	*Cibicidoides* sp.
11H-4, 75–77	108.030	24.122	1.38	0.63	*Cibicidoides* sp.
11H-4, 80–82	108.080	24.126	1.35	0.47	*Cibicidoides* sp.
11H-4, 85–87	108.130	24.131	1.52	0.24	*Cibicidoides* sp.
11H-4, 90–92	108.180	24.135	1.43	0.88	*Cibicidoides* sp.
11H-4, 95–97	108.230	24.14	1.25	0.73	*Cibicidoides* sp.
11H-4, 100–102	108.280	24.145	1.16	0.52	*Cibicidoides* sp.
11H-4, 105–107	108.330	24.149	1.29	0.78	*Cibicidoides* sp.
11H-4, 110–112	108.380	24.154	1.13	0.58	*Cibicidoides* sp.
11H-4, 115–117	108.430	24.159	1.21	0.77	*Cibicidoides* sp.
11H-4, 120–122	108.480	24.163	1.14	0.78	*Cibicidoides* sp.
11H-4, 125–127	108.530	24.168	1.08	0.64	*Cibicidoides* sp.
11H-4, 130–132	108.580	24.172	1.30	0.34	*Cibicidoides* sp.
11H-4, 135–137	108.630	24.177	1.61	0.57	*Cibicidoides* sp.
11H-4, 140–142	108.680	24.182	1.56	0.47	*Cibicidoides* sp.
11H-4, 145–147	108.730	24.186	1.34	0.75	*Cibicidoides* sp.
11H-5, 2–4	108.800	24.193	1.57	0.32	*Cibicidoides* sp.
11H-5, 5–7	108.830	24.196	1.46	0.60	*Cibicidoides* sp.
11H-5, 10–12	108.880	24.2	1.36	0.68	*Cibicidoides* sp.
11H-5, 15–17	108.930	24.205	1.31	0.71	*Cibicidoides* sp.
11H-5, 20–22	108.980	24.209	1.52	0.90	*Cibicidoides* sp.
11H-5, 25–27	109.030	24.214	1.26	0.47	*Cibicidoides* sp.
11H-5, 30–32	109.080	24.219	1.52	0.82	*Cibicidoides* sp.
11H-5, 35–37	109.130	24.223	1.59	0.79	*Cibicidoides* sp.
11H-5, 40–42	109.180	24.228	1.49	0.54	*Cibicidoides* sp.
11H-5, 45–47	109.230	24.233	1.30	0.67	*Cibicidoides* sp.
11H-5, 50–52	109.280	24.237	1.67	1.06	*Cibicidoides* sp.
11H-5, 55–57	109.330	24.242	1.63	0.74	*Cibicidoides* sp.
11H-5, 60–62	109.380	24.246	1.67	0.86	*Cibicidoides* sp.
11H-5, 65–67	109.430	24.251	1.55	0.41	*Cibicidoides* sp.
11H-5, 70–72	109.480	24.256	1.60	0.66	*Cibicidoides* sp.
11H-5, 80–82	109.580	24.265	1.47	0.77	*Cibicidoides* sp.
11H-5, 85–87	109.630	24.269	1.47	0.82	*Cibicidoides* sp.
11H-5, 90–92	109.680	24.274	1.41	0.80	*Cibicidoides* sp.
11H-5, 95–97	109.730	24.279	1.17	0.86	*Cibicidoides* sp.
11H-5, 100–102	109.780	24.283	1.56	0.92	*Cibicidoides* sp.
11H-5, 105–107	109.830	24.288	1.77	1.05	*Cibicidoides* sp.
11H-5, 110–112	109.880	24.293	1.80	0.84	*Cibicidoides* sp.
11H-5, 115–117	109.930	24.297	1.55	0.96	*Cibicidoides* sp.
11H-5, 120–122	109.980	24.302	1.62	0.86	*Cibicidoides* sp.
11H-5, 125–127	110.030	24.306	2.41	0.81	*Cibicidoides* sp.
11H-5, 135–137	110.130	24.316	1.57	0.74	*Cibicidoides* sp.
11H-5, 140–142	110.180	24.32	1.38	0.91	*Cibicidoides* sp.
11H-5, 145–147	110.230	24.325	2.15	0.71	*Cibicidoides* sp.
11H-6, 2–4	110.300	24.331	2.05	0.90	*Cibicidoides* sp.
11H-6, 5–7	110.330	24.334	1.78	0.76	*Cibicidoides* sp.
11H-6, 10–12	110.380	24.339	1.59	0.76	*Cibicidoides* sp.
11H-6, 15–17	110.430	24.343	1.70	1.02	*Cibicidoides* sp.
11H-6, 20–22	110.480	24.348	1.78	0.70	*Cibicidoides* sp.
11H-6, 25–27	110.530	24.353	1.76	0.72	*Cibicidoides* sp.

Table T1 (continued).

Core, section, interval (cm)	Depth (rmcd)	Age (Ma)	$\delta^{13}C$ (‰ VPDB)	$\delta^{18}O$ (‰ VPDB)	Taxon
11H-6, 30–32	110.580	24.357	1.41	0.97	*Cibicidoides* sp.
11H-6, 35–37	110.630	24.362	1.51	0.74	*Cibicidoides* sp.
11H-6, 40–42	110.680	24.367	1.34	0.64	*Cibicidoides* sp.
11H-6, 45–47	110.730	24.371	1.72	0.72	*Cibicidoides* sp.
11H-6, 50–52	110.780	24.376	1.65	0.77	*Cibicidoides* sp.
11H-6, 55–57	110.830	24.38	1.46	0.60	*Cibicidoides* sp.
11H-6, 60–62	110.880	24.385	1.26	0.91	*Cibicidoides* sp.
11H-6, 65–67	110.930	24.39	1.72	0.63	*Cibicidoides* sp.
11H-6, 70–72	110.980	24.394	1.33	0.82	*Cibicidoides* sp.
11H-6, 75–77	111.030	24.399	1.38	0.97	*Cibicidoides* sp.
11H-6, 80–82	111.080	24.403	1.81	0.87	*Cibicidoides* sp.
11H-6, 85–87	111.130	24.408	1.81	0.62	*Cibicidoides* sp.
11H-6, 90–92	111.180	24.413	1.71	0.97	*Cibicidoides* sp.
11H-6, 95–97	111.230	24.417	1.62	0.95	*Cibicidoides* sp.
11H-6, 100–102	111.280	24.422	1.68	0.76	*Cibicidoides* sp.
11H-6, 105–107	111.330	24.427	1.74	0.74	*Cibicidoides* sp.
11H-6, 110–112	111.380	24.431	1.70	0.67	*Cibicidoides* sp.
11H-6, 115–117	111.430	24.436	1.71	0.82	*Cibicidoides* sp.
11H-6, 120–122	111.480	24.44	1.72	0.76	*Cibicidoides* sp.
11H-6, 125–127	111.530	24.445	1.84	0.76	*Cibicidoides* sp.
11H-6, 130–132	111.580	24.45	1.85	0.69	*Cibicidoides* sp.
11H-6, 135–137	111.630	24.454	1.19	0.38	*Cibicidoides* sp.
11H-6, 140–142	111.680	24.457	1.50	0.48	*Cibicidoides* sp.
11H-6, 145–147	111.731	24.461	1.58	0.64	*Cibicidoides* sp.
11H-7, 2–4	111.808	24.467	1.41	0.44	*Cibicidoides* sp.
11H-7, 5–7	111.841	24.47	1.25	0.51	*Cibicidoides* sp.
11H-7, 10–12	111.896	24.474	1.49	0.47	*Cibicidoides* sp.
11H-7, 15–17	111.952	24.478	1.49	0.18	*Cibicidoides* sp.
11H-7, 20–22	112.007	24.482	1.34	0.49	*Cibicidoides* sp.
11H-7, 25–27	112.062	24.487	1.40	0.49	*Cibicidoides* sp.
11H-7, 30–32	112.117	24.491	1.32	0.58	*Cibicidoides* sp.
11H-7, 35–37	112.172	24.495	1.43	0.57	*Cibicidoides* sp.
11H-7, 40–42	112.227	24.499	1.41	0.41	*Cibicidoides* sp.
11H-7, 45–47	112.282	24.504	2.02	0.72	*Cibicidoides* sp.
11H-7, 50–52	112.338	24.508	1.84	0.46	*Cibicidoides* sp.
11H-7, 55–57	112.393	24.512	1.63	0.51	*Cibicidoides* sp.
11H-7, 60–62	112.448	24.516	1.63	0.65	*Cibicidoides* sp.
11H-7, 65–67	112.503	24.52	1.97	0.61	*Cibicidoides* sp.
11H-7, 70–72	112.558	24.525	1.62	0.56	*Cibicidoides* sp.
11H-7, 75–77	112.613	24.529	1.93	0.13	*Cibicidoides* sp.

Note: VPDB = Vienna Peedee belemnite.